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The Distribution of Agricultural Development Gains in India: A Case Study for South and Southeast Asia

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CHAPTER 11

THE DISTRIBUTION OF AGRICULTURAL DEVELOPMENT GAINS IN INDIA: A CASE STUDY FOR SOUTH AND SOUTHEAST ASIA

Martin E. Abel

In the mid-1960's there was great concern about the ability of the poor countries of the world to provide enough food to sustain rapidly growing populations. By the end of the decade there was significant abatement of this view. Partly, this was due to improvement of weather conditions, which were none too good in many of the poor countries during the mid-1960's. For example, India had two extremely serious drougths in the 1965-66 and 1966-67 crop years; the weather has been good during the four subsequent years. But more important, several countries have made marked progress in increasing food production through the adoption of high-yielding varieties of cereals, notably wheat and rice varieties.

While numerous food and agricultural problems remain for most poor countries, there is a growing realization that continued technological advance in agriculture holds considerable promise for alleviating the pressures of population on food supplies. The new high-yielding varieties of rice and wheat have already resulted in sharp increases in food production in a number of countries. As a consequence, concern about agricultural development has shifted from consideration of "who shall survive?" to ones of "who shall benefit from the new-found growth?"

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Recently, issues related to income distribution and employment have gained in importance relative to issues concerning production and productivity. [1] To some extent this concern is politically motivated. Highly unequal distributions of income and rapidly growing numbers of under- and unemployed persons do not contribute to political stability. But also, high rates of under- or unemployment can be a serious restraint to more rapid economic development. This restraint manifests itself in two ways. First, a high proportion of very poor people in the population whose real incomes are growing very slowly, if at all, yields a slow rate of growth in demand. Further, the commodities consumed by the poor segments of the population are typically those which can be produced using relatively labor intensive techniques. High rates of under- and unemployment result in the rate of growth in demand restraining faster rates of growth in output, particularly of the kind which would contribute significantly to increased employment. Second, in most poor countries unskilled labor is a factor of production which is abundant in supply. Increasing employment, particularly if it can result in the formation of productive capital, is one way to stimulate economic growth and development. The agricultural sector (including forestry) in most poor countries offers numerous opportunities for capital formation using labor intensive techniques. Major problems retarding this line of activity are the availability of real resources to finance higher levels of employment, the lack of complementary skilled personnel, and the inability or unwillingness to organize projects in rural areas which can effectively employ large numbers of unskilled labor over

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[1] For an excellent review of available factual knowledge about the employment problems in the poor countries, see Turnham (37).

extended periods of time. The real challenge for development is how to achieve a better distribution of income and employment on the one hand, and to generate increased quantities of productive capital through the expanded employment so that the redistribution of income does not lead to a serious decline in the rate of savings and investment and, therefore, retard economic growth.

In this chapter we will look at what has happened to agricultural development in India during the 1950's and 1960's and how the benefits of this growth have been distributed. This time span covers most of the post-independence period during which there has been strong emphasis on total economic as well as agricultural development. There are both advantages and disadvantages to looking at India as a case study. One great advantage is that considerable economic data relating to agricultural development and income distribution exist and have been extensively analysed, compared with most other developing countries. The great disadvantage is that India is an extremely large, diverse, and very poor country, and its experience may not be directly relevant to a large number of other poor countries.

Review of India's Economic and Agricultural Development

It will be useful to review the performance of the Indian economy generally and the agricultural sector before discussing the distribution of the gains from agricultural development. In this way we will get some idea of the approximate size of the gains which have been distributed.

The Indian economy grew at a moderately rapid rate during the 1950's and 1960's (table 1). The real net national product (old series) grew at an annual rate of 3.3 percent between 1951 and 1967. The corresponding rate for the 1961-68 period was 3.2 percent a year (based on the new series

Table 1. Net National Product and Population, India, 1951-68.

Year[1/]	Net National Product				Per Capita Net National Product				Population
	Old Series	Revised Series	Old Series	Revised Series	Old Series	Revised Series	Old Series	Revised Series	
	Current Prices		1949 Prices	1961 Prices	Current Prices		1949 Prices	1961 Prices	
	billion rupees				billion rupees				millions
1951	95.3		88.5		266.5		247.5		363.4
1952	99.7		91.0		274.2		250.3		369.6
1953	98.2		94.6		265.4		255.7		376.1
1954	104.8		100.3		278.1		266.3		382.9
1955	96.1		102.8		250.3		267.8		390.2
1956	99.8		104.8		255.0		267.8		397.8
1957	113.1		110.0		283.3		275.6		405.8
1958	113.9		108.9		279.6		267.3		414.3
1959	126.0		116.5		303.0		280.1		423.3
1960	129.5		118.6		304.8		279.2		432.7
1961	141.4	132.7	127.3	132.7	325.7	305.0	293.2	305.0	442.7
1962	148.0	140.7	130.6	138.0	333.6	316.0	294.3	309.9	453.4
1963	154.0	149.0	133.1	140.7	339.4	327.0	293.4	308.7	464.3
1964	172.1	171.2	139.7	148.8	370.9	366.9	301.1	318.9	475.5
1965	204.3	200.9	150.0	159.4	430.4	420.2	316.0	335.5	487.0
1966	203.4	205.7	146.6	150.4	418.8	420.2	301.8	307.0	498.9
1967	231.2	236.5	149.5	152.1	465.2	471.2	300.8	302.9	511.3
1968		279.0		165.6		542.3		321.9	524.0

Source: Economic Survey 1968-69, Government of India

1/ National Product Data are for the fiscal year ending March 31. Population is for the year ending June 30.

of net national product). [2] In per capita terms the rate of growth in real net national product was much slower: 1.2 and 0.8 percent a year for the 1951-67 and 1961-67 periods, respectively. The relatively high and growing rates of population growth reduced a moderate rate of total economic growth to a relatively slow rate of economic growth per capita. During the 1950's population grew at an average rate of 2.0 percent per year; the average rate was 2.5 percent a year in the 1960's.

Agriculture looms large in the total economy of India (table 2). Since 1951 agriculture has accounted for about 50 percent of the total net domestic product. There has been no discernable downward trend in agriculture's share of the economy. Thus, economic development to date in the nonfarm sectors has not been fast enough to reduce the relative importance of agriculture in the economy.

We will use crop production as a measure of agricultural output. Crops normally account for between 80 and 85 percent of total agricultural output. Also, time-series data on the output of livestock and livestock products are incomplete (Hendrix and Giri, (16)), making it difficult to characterize the growth in these commodities.

Production of all crops increased by 2.9 percent a year between 1951 and 1969 (table 3). During the same period output of food grains (including pulses) grew by 3.1 percent a year and output of other crops by 2.4 percent. There was significant year to year variability for all categories of crops.

Crop production has kept ahead of population growth, but not consistently ahead of demand, since the early 1950's. For example, between

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[2] For a detailed discussion of the methodology and the estimation procedures for computing national income see (11).

Table 2. Net Domestic Product by Sectors, India, 1951-68 (current prices).

Year[1]	Total Net Domestic Product	Agriculture[2]		Industry[3]		Other	
	billion rupees	billion rupees	percent	billion rupees	percent	billion rupees	percent
1951	95.5	48.9	51.3	15.3	16.1	31.5	32.6
1952	99.9	50.2	50.4	16.8	16.9	32.9	32.7
1953	98.3	48.1	49.0	17.0	17.3	33.2	33.7
1954	104.8	53.1	50.7	17.7	16.9	34.0	32.4
1955	96.2	43.5	45.2	18.1	18.8	34.6	36.0
1956	96.5	42.2	43.7	18.7	19.4	35.6	36.9
1957	113.0	55.2	48.8	20.0	17.7	37.8	33.5
1958	114.1	52.9	46.4	21.2	18.6	40.0	35.0
1959	126.2	62.4	48.3	21.7	17.8	42.1	33.9
1960	129.7	62.1	49.0	23.3	19.1	44.3	31.9
1961	135.2	69.5	51.4	26.9	19.9	38.8	28.7
1962	144.1	72.9	50.5	29.3	20.3	41.9	29.2
1963	152.9	74.8	48.9	32.1	21.0	46.0	30.1
1964	176.8	87.9	49.7	37.2	21.1	51.7	29.2
1965	205.7	105.2	51.1	41.2	20.1	61.3	28.8
1966	212.3	102.0	48.1	44.4	20.9	65.9	31.0
1967	243.9	120.5	49.4	48.7	20.0	74.7	30.6
1968	281.9	149.7	53.1	51.1	18.2	81.1	28.7

Source: Estimates of National Income, Central Statistical Office, Government of India, annual publications.

1/ Fiscal year ending March 31.

2/ Includes forestry and fishing.

3/ Includes mining, manufacture, construction, and gas, electricity and water supply.

Table 3. Indices of Production for Principal Crops, India, 1951-69 (1950=100).

Crop Year[1]	All Crops	Total Food Grains	Total Other Crops	Oilseeds	Cotton	Jute	Mesta	Tea	Coffee	Rubber	Sugar-cane	Tobacco
1951	95.6	90.5	105.9	98.5	110.7	106.3	100.0	103.8	112.3	93.8	113.7	97.3
1952	97.5	91.1	110.5	97.4	119.2	151.4	104.8	109.6	112.7	94.4	122.8	78.0
1953	102.0	101.1	103.8	91.9	121.0	148.6	103.3	115.4	125.9	106.1	101.6	91.3
1954	114.3	119.1	104.7	103.7	151.8	100.0	98.5	100.6	146.5	131.8	89.5	101.5
1955	117.0	115.0	120.9	122.6	163.6	94.8	136.5	110.4	151.8	127.6	115.9	95.1
1956	116.8	115.3	119.9	108.6	153.9	135.8	174.7	107.2	196.1	146.1	119.8	112.9
1957	124.3	120.8	131.5	120.3	181.2	138.7	221.5	117.2	204.1	152.9	137.2	113.7
1958	115.9	109.2	129.5	119.0	178.8	128.8	196.2	115.7	229.8	140.1	138.1	89.4
1959	133.5	130.6	139.4	136.8	175.8	158.7	255.9	119.4	240.8	160.2	141.5	118.2
1960	130.3	127.9	135.0	125.3	132.4	137.4	172.2	122.7	259.6	157.6	153.3	108.7
1961	142.2	137.1	152.6	134.0	202.1	125.3	168.8	120.9	246.4	167.0	183.9	114.3
1962	144.8	140.3	153.9	140.0	174.9	192.7	280.4	133.4	230.4	180.0	173.5	126.2
1963	139.6	133.6	151.6	142.6	199.8	165.0	260.7	130.5	273.7	209.4	152.5	129.3
1964	143.1	136.5	156.5	134.5	208.6	184.0	283.7	130.4	255.5	239.0	172.6	136.4
1965	159.4	150.2	176.7	164.9	217.6	182.4	236.8	140.2	269.0	286.0	200.2	131.0
1966	132.1	120.9	154.8	125.4	183.0	135.5	192.3	137.9	281.6	328.5	201.3	112.8
1967	131.6	123.8	147.4	125.7	191.1	162.4	182.6	141.5	345.1	328.5	158.1	133.9
1968	161.0	159.0	165.1	159.6	213.1	193.1	169.0	144.0	251.3	328.5	165.7	139.7
1969	158.7	157.5	161.0	137.1	203.2	192.6	135.6	142.8	321.7	445.5	193.7	131.6

Source: Economic Survey 1968-69, and Statistical Abstracts 1960, 1962, 1965, 1967, Government of India; also All-India Index Number of Area Under Crops, Agricultural Production and Productivity, 1949-50 to 1968-69, Directorate of Economics and Statistics, Ministry of Food, Agriculture, Community Development and Cooperation, New Delhi.

[1] Year ending June 30.

1961 and 1968 production of food grains increased by 2.2 percent a year. Population grew at 2.5 percent a year and per capita net national product grew at 0.8 percent a year. If we assume an income elasticity of demand for food grains of 0.5, total demand for food grains grew at 2.9 percent a year, exceeding the rate of growth in production by 0.7 percent annually. The difference in growth rates was reconciled by imports and rising food grain prices (table 4), particularly after 1963.

There has been marked variation in the rate of growth of crop production among the States of India. Between the crop years 1952-53 and 1964-65, three states--Punjab, Gujarat, and Madras--had annual rates of growth in crop production of 4 percent a year or more, compared with the all-India rate of 3.0 percent. At the other end of the scale, crop production in Assam increased by only 1.2 percent a year (table 5).

The increases in agricultural output resulted from increases in a variety of inputs, the mix of the latter changing quite markedly during the last two decades.

During the 1950's, a considerable part of the growth in crop output came from the expansion of cultivated area (table 6). Between 1951 and 1961 gross and net cropped area increased by 1.5 and 1.2 percent a year, respectively. Area in food grains increased by 1.7 percent a year during the same period. In the 1960's the rate of expansion of area fell sharply. Between 1961 and 1967 gross cropped area increased by only 0.4 percent a year. And, all of this increase occurred in 1962. From that year on gross cropped area has remained about constant. Both net cropped area and area in food grains increased by 0.5 percent a year.

At the same time there has been a steady expansion in irrigated area,

Table 4. Index Numbers of Wholesale Prices of Selected Commodities, India, 1951-68.

Year	All Commodities	Food Grains	Cereals	Pulses
				March 31, 1953=100
1951	120			
1952	102			
1953	104	98	100	96
1954	100	75	84	66
1955	92	64	73	56
1956	103	84	92	78
1957	109	93	102	84
1958	111	100	105	94
1959	116	102	104	100
1960	123	98	105	93
1961	126	99	102	91
1962	127	101	106	104
1963	132	103	112	109
1964	148	125	134	153
1965	161	143	145	167
1966	183	155	165	178
1967	212	202	207	271
1968	210	207	205	218

Source: Data on the Indian Economy, The Ford Foundation, New Delhi, January 1970.

Table 5. All-India and 15 States: Annual Compound Crop Output Growth Rates and Population Growth, 1952-53 to 1964-65.

State	All Crops	Foodgrains	Nonfood Grains	Population Growth Rate[1]	Foodgrain-Population Growth Ratios
	percent				ratio
Punjab	4.56	3.66	7.04	2.61	1.40
Gujarat	4.55	2.06	6.62	2.61	0.79
Madras	4.17	4.17	4.17	1.25	3.34
Mysore	3.54	3.31	4.08	2.08	1.59
Himachal Pradesh	3.39	3.63	1.50	2.22	1.64
Bihar	2.97	3.05	2.49	2.12	1.44
Maharashtra	2.93	2.20	4.38	2.32	0.95
Rajasthan	2.74	2.42	4.08	2.68	0.90
Andhra Pradesh	2.71	3.21	1.60	1.63	1.97
Madhya Pradesh	2.49	2.32	3.81	2.51	0.92
Orissa	2.48	2.39	2.95	2.16	1.11
Kerala	2.27	3.68	1.70	2.33	1.58
West Bengal	1.94	1.14	3.77	2.92	0.38
Uttar Pradesh	1.66	0.85	3.61	1.84	0.46
Assam	1.17	0.76	1.49	3.15	0.24
All-India	3.01	2.50	3.99	2.50	1.00

Source: Hendrix and Giri (16).

[1] Population growth rates for states are for 1951 to 1961; that for All-India is the estimated rate for the period 1951 to 1965.

Table 6. Area in Crop Production, India, 1951-69.

Year	Total Gross Cropped Area	Total Net Cropped Area	Area in Food Grains	Area in Oil-seeds	Area in Cash Crops
	. . . . . 1,000 hectares				
1951	131,893	118,747	97,323	10,727	3,098
1952	133,234	119,401	97,558	11,685	3,487
1953	137,602	123,388	102,091	11,175	3,489
1954	142,430	126,769	109,467	10,993	2,938
1955	144,009	127,783	97,860	12,522	3,122
1956	146,723	128,769	110,562	12,085	3,678
1957	149,113	130,486	111,141	12,495	4,017
1958	145,832	129,080	108,707	12,278	3,837
1959	151,629	131,828	112,749	12,546	3,727
1960	152,824	132,939	115,823	13,954	4,018
1961	152,716	133,157	115,581	13,770	4,218
1962	156,099	135,352	117,232	14,722	4,729
1963	156,764	136,341	117,844	15,335	4,403
1964	156,846	136,422	117,421	14,823	4,491
1965	158,103	137,916	117,533	15,110	4,711
1966	155,327	136,135	113,174	14,928	4,701
1967	156,638	137,030	115,302	14,995	4,188
1968			121,421	15,667	
1969			120,430	14,585	

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

growing at 2.1 percent a year between 1951 and 1966. During this period total gross irrigated area increased by about 8.4 million hectares. Of this increase rice accounted for 3.3 million hectares; wheat 1.8 million; sugarcane and cotton, 0.8 million hectares each; food crops other than food grains and sugarcane, 0.6 million; pulses and cereals other than rice, wheat, jowar, bajra and maize, 0.5 million; and jowar and nonfood crops other than cotton, 0.3 million hectares each (table 7).

While the expansion of land area slowed significantly in the 1960's and irrigated area expanded at about the same rate in the 1950's and 1960's, the consumption of chemical fertilizer showed a marked increase in the 1960's over the 1950's (table 8). Between 1952 and 1961 consumption of chemical fertilizers increased from 73.3 thousand metric tons to 293.9 thousand metric tons. But by 1968 the level of consumption had reached 1580.0 thousand metric tons. Clearly, chemical fertilizer is becoming a relatively more important source of growth in crop output.

The sharp rise in the consumption of fertilizers can be attributed primarily to two factors. First, since 1963 there has been a rapid rise in the prices of agricultural commodities, particularly food grains (table 4), relative to the price of fertilizer. Second, the introduction of the new high-yielding varieties of cereals, notably wheat and rice in 1965, added greatly to the demand for fertilizer because they are highly responsive to heavy applications of fertilizer.

In some ways we can look at fertilizer as an indicator of use of other modern inputs and supporting activities. The use of plant protection materials, power (diesel and electric motors), farm implements, credit, marketing facilities, etc. all increased more rapidly in the

Table 7. Irrigated Area, by Crops, India, 1951-66.

Year	Total Gross Irrigated Area	Rice	Wheat	Barley	Jowar (Sorghum)	Bajra (Millets)	Maize	Other Cereals and Pulses	Sugarcane	Other Food Crops	Cotton	Other Nonfood Crops
	1,000 hectares											
1951	22,563	9,844	3,402	1,383	463	336	369	2,187	1,183	889	465	1,709
1952	23,180	9,650	3,442	1,491	552	384	564	2,116	1,374	1,038	575	1,629
1953	23,237	9,650	3,732	1,630	546	382	523	2,161	1,177	1,046	526	1,494
1954	24,308	10,428	3,885	1,650	546	393	446	2,609	979	1,166	592	1,614
1955	24,821	10,445	3,970	1,487	561	412	572	2,569	1,135	1,190	757	1,723
1956	25,692	11,035	4,150	1,460	625	395	448	2,513	1,274	1,165	834	1,743
1957	25,707	11,473	4,002	1,322	566	396	503	2,241	1,374	1,216	899	1,765
1958	26,628	11,747	3,918	1,388	611	329	555	2,614	1,380	1,232	1,018	1,834
1959	26,948	12,045	4,016	1,374	621	344	446	2,614	1,340	1,258	998	1,892
1960	27,413	12,120	4,259	1,394	640	299	431	2,668	1,477	1,344	938	1,843
1961	27,941	12,492	4,234	1,333	655	320	556	2,443	1,673	1,351	966	1,918
1962	28,461	12,986	4,327	1,321	671	292	426	2,428	1,672	1,340	1,040	1,958
1963	29,454	13,361	4,594	1,309	682	294	533	2,619	1,521	1,475	1,089	1,978
1964	29,692	13,235	4,723	1,271	719	253	524	2,596	1,565	1,496	1,260	2,050
1965	30,414	13,488	4,898	1,261	681	260	599	2,606	1,801		1,224	2,029
1966	30,921	13,114	5,238		714				2,008		1,263	2,052

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

Table 8. Consumption of Fertilizer, India, 1952-68.

Year[1/]	Nirtogen (N)	Phosphate (P_2O_5)	Potash (K_2O)	Total
	. . . . . 1,000 metric tons			
1952	58.7	6.9	7.7	73.3
1953	57.8	4.6	3.3	65.7
1954	89.3	80.3	7.5	177.1
1955	94.8	15.0	11.1	120.9
1956	107.5	13.0	10.3	130.8
1957	123.1	15.9	14.8	153.8
1958	149.0	21.9	12.8	183.7
1959	172.0	29.5	22.4	223.9
1960	229.3	53.9	21.3	304.5
1961	211.7	53.1	29.1	293.9
1962	291.5	63.9	28.0	383.4
1963	360.0	81.4	36.5	477.9
1964	425.9	120.8	51.9	598.6
1965	492.2	148.5	71.6	712.3
1966	582.6	134.1	89.6	806.3
1967	830.2	274.6	133.7	1238.5
1968	1070.0	340.0	170.0	1580.0

Source: Hendrix and Giri (16).

[1/] Crop year ending June 30.

1960's than in the 1950's.

Thus, there has been rather rapid modernization of Indian agriculture in the 1960's with increased use of purchased, modern inputs relative to traditional sources of growth such as land, labor and traditional capital inputs. In addition, there has been rapid technological advance in the form of new high-yielding varieties of cereals since 1965. But it has also been the case that growth in agricultural output has been unevenly distributed among the States of India (table 5).

Distribution of Rural Incomes

We are interested in how the distribution of rural incomes has changed over time as this will provide us with a picture of the extent to which different segments of the rural population have shared in economic development. Data on the distribution of income are not available beyond 1961-62. However, the various rounds of the National Sample Survey (NSS) provide data on the levels and distributions of total consumer expenditures and expenditures for various commodities. Since the NSS data enable us to examine changes in expenditures of different income groups over time, we propose to use these data as a measure of economic well-being of the rural population.

Before doing so, however, a few words are in order concerning the relationship between the NSS data and the National Income Accounts data on private consumption expenditures to get some idea of the "consistency" which exists between the two sources of information. Two recent papers by Srinivasan and Vaidyanathan (34) and Mukherjee and Chatterjee (22) deal with this subject. The NSS estimates of consumption expenditures exhibit a high degree of stability in the pattern of consumption through

time, although there are systematic changes in the share of certain commodities in total expenditures. In general, there is a close correspondence between estimates of total private consumer expenditures obtained from the NSS data and the private consumption series of the national income data for the period 1954-55 to 1968-69. Between 1954-55 and 1963-64 the NSS estimates are slightly but consistently above the national income data; thereafter, the reverse is true and the difference in the two series becomes quite large. The reason for the divergence in the two series is not known. Finally, the distribution of expenditures among broad commodity groups such as food and nonfood is very similar for the NSS data and the national income data. However, there are large differences between the two series for certain specific commodities. For example, the NSS estimate of food grain consumption is considerably higher while the estimates for most other food items are lower than those obtained from the national income data.

In spite of the limitations and uncertainties associated with the NSS data, 3/ they would appear to be adequate for judging broad changes in the distribution of consumption among income groups and for making some types of normative statements about poverty such as changes over time in the number of people who fall below a certain level of (real) total consumption.

3/ There are a number of unanswered questions about the NSS data which bear on their general reliability for use in analysing changes in income (consumption) distribution. It is not known whether there is a systematic bias which gives rise to underestimation of consumption at the higher levels of income. Some analysts argue that such a bias exists (14). Similarly, we do not know if there has been any systematic change in the degree of bias, assuming that a bias existed in the first place.

Measurement of inequalities of income

There have been numerous studies of the distribution of income or consumption in India and how it has changed over time. Most of the studies on income distribution are based on NSS data on the distribution of consumer expenditures adjusted for savings and direct taxes. 4/ Other studies have measured the distribution of consumer expenditures. The most common measure of inequality used is the Lorenz Ratio.

The results of some of these studies are summarized in table 9. We observe considerable variation over time and among studies of the value of the Lorenz Ratio--from 0.29 to 0.48. We have distinguished between those studies dealing with income and those dealing with inequalities in consumption.

Two patterns seem to emerge. First, over time the distribution of either income or consumption has been less unequal in rural areas than in urban areas. Second, while there would appear to be a downward trend in the inequality of rural incomes, there has been no decline or possibly even a slight increase in the inequality of urban incomes or consumption. 5/

However, one must exercise some caution in the interpretation of these results. There are significant differences among the various studies of income distribution in the assumptions employed for the distribution of savings, adjustments made in the NSS data to go from the

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4/ (5) is based on a national survey of rural and urban savings and provides direct estimates of the distribution of income at the national level.

5/ Ranadive (28) makes an even stronger case for an "unequivocal increase" in the inequality of urban incomes.

Table 9. Summary of Measures of Inequality in the Distribution of Income and Consumption, India, Selected Time Periods.

Study	Time Period	Lorenz Ratio
Income		
Iyengar and Mukherjee (17)	1952-53 to 1956-57	0.29
Ojha and Bhatt (26)	1953-54 to 1956-57	0.36
Ahmed (4)	1956-57	0.44
NCAER (5)		
Urban	1960	0.48
Rural	1962	0.41
Swamy (36)	1951-52 to 1959-60	0.47
Ojha and Bhatt (27)		
Rural	1953-55	0.34
Urban	1953-55	0.40
Rural	1961-64	0.32
Urban	1961-64	0.47
Consumption		
Chatterjee and Bhattacharya (13)		
Rural	1954-55	0.35
	1967-68	0.29
Urban	1954-55	0.39
	1967-68	0.34
Ojha and Bhatt (27)		
Rural	1953-55	0.33
Urban	1953-55	0.37
Rural	1961-64	0.30
Urban	1961-64	0.36
Vaidyanathan (38)		
Rural	1957-58	0.33
	1967-68	0.30

sampling periods to annual data, etc. Further, studies for different time periods would reflect changes in commodity prices. We must be concerned not only with changes in the general price level, but also with changes in the relative prices of groups of commodities like, for example, food grains. If food grain prices rise relatively faster than prices of other commodities this will depress the real income or consumption levels of the lower income groups relative to the higher income ones (9, 22, 38) and affect the distribution of income or consumption. Given these limitations of the data and analyses, it is difficult to make strong statements about how the distribution of income or consumption has changed over time. We can, however, say that incomes in India are distributed very unevenly.

Another way to look at the problem is to use some normative definition of poverty and to see what has happened to the number of poor through time. Two recent lines of work by Dandekar and Rath (14) and by Bardhan (6, 7, 8, 9), based on National Sample Survey data but employing different methodologies analyse the extent to which the number of people whose consumption levels fall below a normative poverty line has changed during the 1960's.

Dandekar-Rath study

The Dandekar-Rath study addressed itself to the measurement of "poverty" in India and what might be done to eliminate it. The concept of poverty is a normative one. The quantitative definitions used in the study are as follows: anyone in the rural sector with a monthly income of Rs. 15 or less or Rs. 180 or less per year, and anyone in the urban sector with a monthly income of Rs. 22.5 or less or Rs. 270 or less per year

(measured in terms of 1960-61 prices) was considered to be in the poverty category: i.e., have a level of income below that required to provide a bare minimum level of subsistence. 6/ The urban standard is higher than that for the rural sector because of a generally higher level of living costs in urban areas.

From the data presented in table 10 we see that in both 1960-61 and in 1967-68, 40 percent of the rural population and 50 percent of the urban population were "poor". With the growth in population during this period (table 11), the absolute number of people with incomes below the minimum subsistence level also increased. In 1960-61 there were 144.2 million rural poor and 38.7 million urban poor, or a total of 180.9 million persons below the poverty line. By 1967-68, this number had grown to 214.4 million with 165.2 in the rural sector. 7/ Further, during the 1960's

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6/ The minimum subsistence level for the rural population of Rs. 15 per month is below the level of Rs. 20 per month established by a Study Group for the Planning Commission in 1962 (6).

7/ The analysis of Dandekar and Rath (14) has been criticized for the "arbitrary" adjustments which the authors made in the NSS data (see Srinivasan and Vaidyanathan (34)). Basically, these consisted of two adjustments. First, it was observed that the NSS estimates of total consumption expenditures were generally below those from the national income data in 1967-68. This was discussed earlier. While Mukherjee and Chatterjee (22) felt that this difference was well within the range of reasonable errors in estimation, Dandekar and Rath (14) felt that it was due to some systematic underestimation of consumption by the NSS procedures. Second, the unadjusted NSS data showed per capita consumption expenditures by the highest income groups in 1967-68 to be below the estimated level in 1960-61. Dandekar and Rath described this as "incredible" and therefore adjusted upward the 1967-68 consumption levels for the highest income groups. While both of these adjustments, or more precisely the justification given for them, can be questioned, particularly the latter one, they are not of such a magnitude as to destroy the general pattern of change in consumption levels for the lower income groups. In fact, the unadjusted data show a somewhat more marked decline in the consumption levels of the 40 percent of the population with the lowest consumption levels than do the adjusted figures. (For a more detailed discussion see Dandekar and Rath (14)).

Table 10. Per Capita Annual Consumer Expenditures in Different Sections of the Population in India in 1960-61 and 1967-68 at 1960-61 Prices

Section of Population (percent group)	1960-61			1967-68		
	Rural	Urban	Urban as Percent of Rural	Rural	Urban	Urban as Percent of Rural
	. . . rupees . .		percent	. . . rupees . .		percent
0 - 5	75.6	96.2	127.2	74.8	78.2	104.5
5 - 10	100.4	129.7	129.2	102.0	112.4	110.2
10 - 20	124.2	156.1	125.7	126.5	145.7	115.2
20 - 30	150.1	191.0	127.2	153.4	183.3	119.5
30 - 40	174.4	223.8	128.3	179.0	220.1	123.0
40 - 50	198.0	256.6	129.6	205.3	259.5	126.4
50 - 60	227.0	295.8	130.3	236.2	304.4	128.9
60 - 70	258.5	342.5	132.5	269.8	358.9	133.0
70 - 80	303.1	421.3	139.0	316.3	441.6	139.6
80 - 90	382.5	553.5	144.7	399.2	580.2	145.3
90 - 95	493.3	753.4	152.7	514.8	789.8	153.4
95 -100	870.6	1268.8	145.7	908.6	1330.0	146.4
All Sections	258.8	356.4	137.7	268.6	364.9	135.9

Source: V. M. Dandekar and Nilakantha Rath (14).

Table 11. Population of India, Rural and Urban, 1960 and 1967.

Year	Rural	Urban	Total
	. . . . . millions		
1960	355.4	77.3	432.7
1967	413.0	98.3	511.3

Source: P. D. Ojha (25).

the income gap between the rural and urban poor narrowed; i.e., the economic position of the urban poor deteriorated relative to that of the rural poor.

In summary, the Dandekar-Rath study shows that except for the poorest 5 percent of the rural population there has not been a deterioration in the real consumption levels of lower income groups; but for the urban poor, there has been a decline in their real level of consumption in the 1960's. When we add the effects of population growth, the number of "poor" people in India increased markedly between 1960-61 and 1967-68--from about 180 to about 215 million. The slow rate of growth in national income during this period wasn't enough to even hold constant the number of people with below minimum levels of living.

Bardhan Studies

In a study of rural poverty in India, Bardhan (6, 7, 8, 9) has utilized the same normative poverty line (Rs. 15 per person per month in 1960-61 prices) and the same NSS data as Dandekar and Rath. However, Bardhan employed separate price deflators for the poorer sections of the rural population than for the remainder of the rural population to get real levels of consumption expenditures in 1967-68.

Bardhan argues that use of the national income deflator to obtain 1967-68 consumption levels in terms of 1960-61 prices underestimates the number of rural poor. First, the national income deflator includes the prices of both agricultural and manufactured commodities. During the 1960's the price of agricultural commodities rose at a much faster rate than finished manufactured products. Since the weight of manufactured consumer goods in the budgets of the rural poor is much lower than the national average, the national income deflator underestimates the rise

in the prices paid by the rural poor. Even for agricultural commodities the prices of those purchased by the poor rose faster than those purchased by the medium and higher income groups. For example, prices of coarse cereals rose faster than the prices of "superior" cereals.

Second, prices of services have grown at a relatively slow rate. Since the poor purchase relatively few services, again the national income deflator would lead to an underestimate of the price rise for items purchased by the poor and, therefore, lead to an underestimate of their numbers.

Bardhan's estimates of the percent of the rural population with consumption levels below the minimum level of living of Rs. 15 per person per month at 1960-61 prices are given in table 12. In 1960-61 he estimates that 38 percent of the rural population fell below the poverty line. This is very close to the Dandekar and Rath estimate of 40 percent. For 1967-68, Bardhan estimates that 53 percent of the rural population or some 206 million people fell below the poverty line, a significant increase over 1960-61. Thus, Bardhan's analysis indicates a greater intensification of poverty in India than does the Dandekar-Rath analysis.

There has been a very substantial rise in the percent of the rural population with consumption below the minimum level in Assam, Bihar, Gujarat, Madhya Pradesh, Mysore, Punjab, Uttar Pradesh and West Bengal. Most puzzling is the sharp increase in the number of rural poor in Punjab, the showcase of the "Green Revolution". Apart from Punjab, the pattern of change among the States generally conforms to patterns of growth in population, agricultural and nonagricultural output, and employment.

Unlike Dandekar and Rath, Bardhan chose not to adjust the NSS data

Table 12. Percentage of People Below Minimum Level of Living of Rs. 15 per Month at 1960-61 Prices.[1]

States	1960-61	1967-68
	percent	
Andhra Pradesh	47	39
Assam	14	21 - 32
Bihar	38	61 - 71
Gujarat	25 - 37	48
Haryana[2]	-	28
Jammu and Kashmir	8	12
Kerala	42	49
Madhya Pradesh	36 - 47	61
Maharashtra	40	56
Mysore	34	48
Orissa	56	64
Punjab	13	32
Rajasthan	33	37
Tamil Nadu	46 - 61	52 - 62
U. P.	39	61
West Bengal	22 - 42	61 - 74
All-India	38	53

Source: Bardhan (6, 7, 9).

[1] Since the estimates are based on consumption intervals it is not always possible to get point estimates without interpolation. In some cases where the estimates do not lie close to the end points of an interval, the estimates are given as a range.

[2] In 1960-61 Haryana and Punjab were one State.

for 1967-68 upward to correspond with the estimate of total consumption obtained from the national income data. This accounts for some of the increase--probably about half--in the percent of the rural population falling in the poverty category. However, the Bardhan studies would still show an increase in the proportion of the rural population falling below the poverty line because prices during the 1960's have moved against the poor.

To summarize: In the seven years between 1960-61 and 1967-68 the number of poor people in rural India increased markedly--from about 144 million in 1960-61 to between 165 and 206 million in 1967-68. A large part of this increase was accounted for by rapid population growth in the face of only moderate growth in total income. Another part of the increase resulted from the prices of things which weigh heavily in the expenditure patterns of the poor increasing much faster than the prices of other commodities and services. While there appeared to be a trend toward reduction in inequalities of rural incomes during the 1950's, analysis for the 1960's would suggest that, at best, the distribution of incomes remained the same. However, there is some evidence to suggest that inequalities actually increased.

One can get a good understanding of the sources of inequality in rural incomes in India if one looks at the inequality in the distribution of the size of operational holdings of land. Operational holdings are defined as the land a person cultivates, whether he owns that land or leases it from someone else. Data for 1960-61 on the distribution of rural households by size of operational holding for the different States of India are presented in table 13.

Table 13. Percentage Distribution of Rural Households by Size of Operational Holdings, India, 1960-61.

State	Size Class of Operational Holdings (acres)						
	Less Than 1.00	1.00 to 2.49	2.50 to 4.49	5.00 to 9.99	10.00 to 14.99	15.00 and Over	Total
	. . . . . .percent						
Kerala							
Household	69.46	15.73	8.75	4.25	1.09	0.72	100.00
Area	12.40	18.41	23.14	21.37	10.05	4.63	100.00
Tamil Nadu							
Household	58.18	16.89	12.94	8.44	2.20	1.35	100.00
Area	3.14	14.87	23.26	28.99	13.22	16.52	100.00
Assam							
Household	44.91	15.91	24.01	12.85	1.73	0.59	100.00
Area	2.19	11.58	36.33	36.11	9.01	4.78	100.00
West Bengal							
Household	46.62	16.95	19.62	12.31	3.12	1.38	100.00
Area	2.31	11.58	27.98	32.32	14.37	11.44	100.00
Jammu and Kashmir							
Household	24.50	29.64	26.16	15.56	2.98	1.16	100.00
Area	2.29	16.32	29.18	33.12	11.20	7.89	100.00
Union Territories							
Household	37.44	13.53	26.81	15.94	4.59	1.69	100.00
Area	1.43	7.80	30.53	32.63	14.93	12.68	100.00
Bihar							
Household	46.31	18.86	17.60	11.19	3.44	2.60	100.00
Area	3.92	10.99	21.73	26.42	14.12	22.82	100.00
Orissa							
Household	42.80	16.90	19.24	13.48	4.50	3.08	100.00
Area	1.52	8.34	20.72	28.05	16.04	25.33	100.00
Uttar Pradesh							
Household	35.39	20.19	21.89	14.77	4.44	3.32	100.00
Area	2.17	9.60	21.96	28.72	15.11	22.44	100.00
Punjab and Haryana							
Household	49.32	7.30	8.46	14.87	8.74	11.31	100.00
Area	0.60	2.19	5.55	19.64	19.50	52.52	100.00
Andhra Pradesh							
Household	50.07	15.88	11.15	11.15	4.52	7.23	100.00
Area	0.98	5.99	9.48	17.93	12.68	52.94	100.00
Mysore							
Household	34.17	9.82	13.23	21.28	8.72	12.78	100.00
Area	0.25	2.40	6.72	21.28	14.97	54.38	100.00
Gujarat							
Household	36.42	10.67	11.59	16.17	9.49	15.66	100.00
Area	0.38	2.54	5.78	15.44	15.27	60.59	100.00

Table 13. Continued

State	Size Class of Operational Holdings (acres)						
	Less Than 1.00	1.00 to 2.49	2.50 to 4.49	5.00 to 9.99	10.00 to 14.99	15.00 and Over	Total
	. . . . . percent						
Madhya Pradesh	28.09	11.11	15.63	20.33	10.26	14.58	100.00
Household	0.37	2.59	7.47	19.07	16.36	54.14	100.00
Area							
Maharashtra							
Household	38.21	10.39	12.40	14.10	8.34	16.56	100.00
Area	0.34	2.31	5.81	13.06	13.12	65.36	100.00
Rajasthan							
Household	15.56	11.33	16.58	21.62	11.50	23.41	100.00
Area	0.13	1.69	5.07	12.90	11.43	68.78	100.00
All-India							
Household	41.96	15.63	16.17	13.83	(12.41)		100.00
Area	1.30	5.77	12.74	21.03	(59.16)		100.00

Source: Dandekar and Rath (14) and Vaidyanathan (38).

For India as a whole, 41.96 percent of rural households either operated no land or less than one acre and operated only 1.3 percent of the cultivated land. Households operating no land or less than 2.5 acres constituted 57.59 percent of the rural households and operated 7.07 percent of the land. At the other extreme, 12.41 percent of the households operated holdings of 10 acres or more which accounted for 59.16 percent of the land.

The variations among States is also instructive. In Rajasthan, 15.56 percent of the rural households operated no land or less than 1.00 acre while in Kerala 69.46 percent of the rural households operated no land or farmed less than 1.00 acre; 85.19 percent of the rural households operated less than 2.5 acres.

Clearly, one of the major sources of inequality in rural incomes is the unequal distribution of land among the rural population. Of the 40 percent of the rural population which falls below the poverty line, about 15 percent are landless laborers and 25 percent operate very small holdings (14). Another source is the lack of sufficient nonfarm employment for the landless laborers and those households operating small parcels of land to provide adequate total income.

The New Agricultural Strategy [8/]

One might be particularly interested in the impact of the new high-yielding varieties of grains on the distribution of incomes in rural India. While the new seeds were introduced in 1965-66 as part of a set of programs called The New Agricultural Strategy, their impact on

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8/ This section draws heavily on Abel (2).

production did not show up until 1967-68, and then only for wheat. The reasons for this are that the quantities of the new seeds available to farmers were relatively small in the preceding two years, and the severe drougths of 1965-66 and 1966-67 depressed the level of food grain production markedly so that it is difficult to isolate the effect of the new high-yielding varieties. Therefore, the analysis of the distribution of income or consumption presented in the previous section would capture the impact of the new seeds only in 1967-68, and this was just the beginning of the new seed-fertilizer technology.

The New Agricultural Strategy was a package of measures designed to get the quickest possible increase in food grain production. It consisted of incentive prices to farmers and the concentration of the use of new, high-yielding varieties of wheat, rice and maize (and later, jowar (sorghum) and bajra (millet)), fertilizer, and plant protection materials on an estimated 32 million acres of land which had an "assured" supply of water. It was a strategy born out of acute food shortages with the attendant upward spiralling of food prices (35).

This set of policies and programs has come in for a growing measure of criticism on two counts. First, there are some who feel that the present policy and program structure will not yield desired rates of growth in agricultural output. Second, there is a growing concern that the benefits of the growth in agricultural output are concentrated in the hands of certain classes of people and in certain regions, leaving large groups of people in the backwaters of development. I would like to put the New Agricultural Strategy in an historical perspective before commenting on these two sets of criticisms.

This was not the first time in the recent history of India when food shortages and a strong emphasis on increasing food production in the most expeditious manner were matters of national concern. One can go back in history at least to the 1940's and the Grow-More-Food Campaign. Less remote in time, the decline in food grain production in 1957-58 raised some doubts about whether production was growing rapidly enough to meet the country's future needs. This concern was translated into a study of the nation's food situation which was published in 1959 under the title, Report on India's Food Crisis and Steps to Meet It (31). This study concluded that:

(1) The Third Plan target of 110 million tons of food grains produced by 1965-66 would not be achieved with the existing set of programs; rather a level of production of about 82 million tons was more likely.

(2) There was need for a greatly accelerated effort in agricultural development consisting of:

   a) Stabilization of farm prices at incentive levels;

   b) A public works program for increasing food production and village employment;

   c) Greatly accelerated use of chemical fertilizers;

   d) Intensification of irrigation and drainage programs;

   e) Security of land tenure and land consolidation;

   f) Large scale expansion of credit through cooperatives;

   g) Progressive reduction in cattle numbers;

   h) Creation of a more streamlined administrative mechanism for specific and more coordinated implementation of agricultural programs;

i) Strengthening of the extension services down to the village level; and finally

j) Selection of certain crops and certain areas which have the greatest potential for increased production for intensive agricultural development efforts.

Some of the recommendations of the Food Crisis Report became the basis for the Intensive Agricultural District Program (IADP), started in 1960-61 and noted for its "package of practices" approach to agricultural development. Subsequently an expanded, but modified, version of the Intensive Agricultural District Program was extended to a much larger area under the name of the Intensive Agricultural Area Program (15).

It is abundantly clear that all the programs from the Intensive Agricultural District Program to the New Agricultural Strategy placed primary, but not exclusive, emphasis on increasing food grain production as quickly as possible. And, this was to be accomplished by concentrating efforts in those areas of the country (and indirectly on those farms) which had the potential for rapid progress.

The reasons for this approach are equally evident. India was gravely concerned in the early and mid-1960's with "food enough." Many felt, and with considerable justification, that the sharply rising prices of food and the acute food shortages of the drought years 1965-66 and 1966-67 represented a serious impediment to economic progress, let alone the social problems they created or helped to aggravate. Food grain production fell precipitously from 89 million tons in 1964-65 to 72 million tons in 1965-66, with only 74.2 million tons of food grains produced in 1966-67. The architects of the New Agricultural Strategy,

while consciously aware of the disparities which would be created by concentrating increased agricultural production in selected areas and on selected types of farms, were also concerned with questions of equity. But these questions mainly concerned the equity of survival.

As India's food situation has become more comfortable a new set of equity questions, rooted in the past but highlighted by the events of the times, has come to the forefront. Questions of "equity" and "economic and social justice" are rapidly assuming positions of pride-of-place in the hierarchy of concerns about rural development.

More about this matter later. First, let's examine the impact of the New Agricultural Strategy on food grain production.

Accomplishments

An examination of the long-term trend in food grain production (table 14) indicates that production increased from 54.9 million tons in 1951 to 99.5 million tons in 1970, or at an annual rate of 3.2 percent. (Food grain production rose to 107.8 million tons in 1971.) This same growth rate also obtained in the 1951-65 period (20). Thus, the rate of growth in food grain production during the period of the New Agricultural Strategy--since 1965--enables only a continuation of the past trend. And, some observers feel that the same rate of growth will prevail through the first half of the 1970's (32).

Should one interpret the pervasiveness of the trend rate of growth in food grain production as a failure of the New Agricultural Strategy? It would appear from the aggregate food grain production figures that the New Agricultural Strategy did not contribute much to increasing production. But if one looks at the sources of growth in production quite a different

picture emerges. Between 1951 and 1965 agricultural production grew at 3.1 percent per annum (3.2 percent for food grains). This rate of growth consisted of a 1.40 percent rate of growth in gross cropped area, a 1.33 percent rate of growth in per acre productivity, and a 0.37 percent rate of growth due to changes in cropping patterns (20). Thus, nearly one-half of the growth in agricultural output came from the expansion of gross area under cultivation. The major expansion in cultivated area took place in the 1950's (table 6). Very little new cultivated land was brought into production during the Third Plan Period (1961-66). And, net cultivated area is expected to remain about constant in the Fourth Plan period (1969-74). This means that continuance of the historical rate of growth of agricultural and food grain production through the 1960's reflects a sharply increased rate of growth in productivity per acre, since essentially all of the increased output has come from higher yields, more intensive use of land and changes in cropping patterns (1). These observations are supported by what has happened to the use of inputs, which may be just as good, if not a better measure of progress in increasing agricultural output as a direct measure of output itself (18). For example, fertilizer consumption ($N + P_2O_5 + K_2O$) increased from 306,000 metric tons in 1960-61 to 1,750,000 metric tons in 1968-69. During the same period the number of electric and diesel pump-sets increased from 421,000 to 1,688,000 and the area covered by plant protection measures from 6.4 million hectares to 40 million hectares (15).

One conclusion is clear: Without arguing about the degree of success--targets vs. performance--the New Agricultural Strategy has accomplished in a significant way what it was designed to do; namely, increase food grain

production quickly beyond what would have been possible without the high-yielding varieties, an expanded supply of inputs, and a set of factors and product prices which make the use of these new inputs profitable to farmers.

Regional distribution of benefits

The question still remains as to who has benefited from the New Agricultural Strategy and where those farmers are located. Inspection of data on food grain production at the national level (table 14) indicates that to date wheat has been at the forefront of accomplishments of the New Agricultural Strategy. Of the 18.8 million ton increase in total food grain production between 1965 and 1971, wheat alone accounted for 10.9 million tons or about 60 percent. Rice, bajra and other cereals showed only modest increases, while pulse production declined slightly and jowar production showed virtually no change.

We next look at the geographic distribution of these changes in production. Data are available for the crop years 1966-67, 1967-68, 1968-69 and 1969-70 on the total acreage and acreage planted to high-yielding varieties of wheat and paddy, by States. 9/ These are the two major food grain crops--wheat showing a high rate of adoption of high-yielding varieties and paddy showing only a modest rate of adoption.

In the case of wheat there has been a very rapid expansion in the area planted to high-yielding varieties (tables 15a, 15b, and 15c). For all of India, area in wheat planted to high-yielding varieties was 539.3 thousand hectares or only 4.3 percent of the total in 1966-67. By the 1969-70 crop year the area under high-yielding varieties had expanded to 6,149.0 thousand

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9/ While one might question the accuracy of certain portions of these data, the overall picture which emerges does not seem at all unreasonable.

Table 14. Production of Food Grains, India, 1951-197 .

Crop Year Ending June 30	Total Food Grains	Rice	Wheat	Jowar	Bajra	Other Cereals	Pulses
	. . . . . million metric tons						
1951	54.9	22.1	6.8	6.2	2.7	7.9	9.2
1952	52.0	21.3	6.2	6.1	2.4	7.7	8.3
1953	58.1	22.9	7.5	7.4	3.2	9.1	8.0
1954	67.1	28.2	8.0	8.1	4.6	8.7	9.5
1955	67.8	25.2	9.0	9.2	3.5	10.1	10.8
1956	69.3	28.7	8.9	6.7	3.5	9.8	11.7
1957	69.9	29.0	9.4	7.3	2.9	9.7	11.6
1958	63.5	25.3	7.9	8.4	3.6	8.6	9.6
1959	74.3	30.2	9.9	8.8	3.6	9.6	12.2
1960	77.7	31.7	10.3	8.6	3.5	10.8	12.8
1961	82.0	34.6	11.0	9.8	3.3	10.6	12.7
1962	82.7	35.7	12.1	8.0	3.6	11.5	11.8
1963	80.2	33.2	10.8	9.8	4.0	10.9	11.5
1964	80.6	37.0	9.9	9.2	3.8	10.6	10.1
1965	89.0	39.0	12.3	9.8	4.4	11.0	12.4
1966	72.0	30.7	10.4	7.5	3.7	10.0	9.8
1967	74.2	30.4	11.4	9.2	4.5	10.4	8.4
1968	95.6	37.9	16.6	10.1	5.1	13.7	12.2
1969	94.0	39.8	18.7	9.8	3.8	11.6	10.4
1970	99.5	40.4	20.1	9.7	5.3	12.3	11.7
1971	107.8	42.4	23.2	8.2	8.0	14.4	11.6

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

Table 15a. Wheat: Total Area and High-Yielding Variety (HYV) Area by States and by Years, 1966-67 to 1969-70.

State	1966-67		1967-68		1968-69		1969-70	
	Total	HYV	Total	HYV	Total	HYV	Total	HYV
	1000 hectares							
Andhra Pradesh	13.9	-	13.8	-	12.7	-	16.1	10.0
Assam	5.7	0.2	6.7	0.8	7.5	4.5	11.8	8.0
Bihar	809.4	25.1	1054.4	199.5	1095.3	301.1	1145.0	425.0
Gujarat	460.8	0.4	552.6	160.9	502.5	167.4	432.6	16.0
Haryana	738.0	13.4	845.5	101.2	895.0	259.0	1017.1	445.0
Jammu & Kashmir	161.3	0.8	186.7	28.4	200.0	36.4	210.0	36.0
Kerala	-	-	-	-	-	-	-	-
Madhya Pradesh	2129.7	16.2	2661.1	45.4	3005.6	80.9	3175.7	155.0
Maharashtra	876.1	42.5	891.4	13.8	873.1	63.5	865.1	145.0
Mysore	298.0	0.8	304.7	10.4	309.5	26.3	327.3	36.0
Orissa	15.9	0.8	14.5	3.7	14.1	4.2	14.9	5.0
Punjab	1615.0	58.7	1804.0	639.0	2086.0	1011.7	2162.0	1417.0
Rajasthan	961.3	9.3	1264.5	125.4	1162.3	190.6	1253.6	292.0
Tamil Nadu	1.4	-	1.0	-	1.1	-	1.1	-
Uttar Pradesh	4394.3	363.0	4969.7	1586.8	5239.1	2514.8	5378.4	2838.0
West Bengal	55.4	8.1	79.0	27.5	150.0	82.2	240.0	177.0
TOTAL	12536.2	539.3	14649.6	2942.8	15553.8	4742.6	16625.5	6149.0

Source: Ministry of Agriculture, Government of India.

Table 15b. Percent of Wheat Area Planted to High-Yielding Varieties, by States, 1966-67 to 1969-70.

State	1966-67	1967-68	1968-69	1969-70
	percent			
Andhra Pradesh	-	-	-	62.2
Assam	3.5	11.9	60.0	67.8
Bihar	3.1	18.9	27.5	37.1
Gujarat	0.1	29.1	33.3	37.0
Haryana	1.8	12.0	28.9	43.8
Jammu & Kashmir	0.5	15.2	18.2	17.1
Kerala	-	-	-	-
Madhya Pradesh	0.8	1.7	2.7	4.9
Maharashtra	4.9	1.5	7.3	16.8
Mysore	0.2	3.4	8.5	11.0
Orissa	5.0	25.5	29.8	33.6
Punjab	3.6	35.4	48.5	65.5
Rajasthan	1.0	9.9	16.4	23.3
Tamil Nadu	-	-	-	-
Uttar Pradesh	8.3	31.9	48.0	52.8
West Bengal	14.6	34.8	54.8	73.8
TOTAL	4.3	20.1	30.5	37.0

Table 15c. Production of Wheat by States, 1964-65 to 1969-70.

State	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70
	. . . . . 1000 metric tons					
Andhra Pradesh	4.4	2.1	2.8	2.7	3.0	4.0
Assam	3.3	3.4	3.5	4.3	4.7	7.1
Bihar	417.8	477.3	365.0	913.5	1259.0	1200.0
Gujarat	415.9	579.3	456.9	700.4	620.5	591.6
Haryana	920.2	869.0	1054.0	1466.4	1522.0	2119.5
J & K	81.7	111.2	112.2	142.2	210.0	250.0
Kerala	-	-	-	-	-	-
Madhya Pradesh	1980.9	1327.3	1031.4	1881.6	2007.5	2216.0
Maharashtra	407.7	304.5	366.6	360.4	428.1	390.5
Mysore	107.7	50.0	47.0	133.4	160.0	136.3
Orissa	7.2	10.3	14.2	15.3	17.4	18.9
Punjab	2360.0	1916.0	2493.9	3352.0	4520.0	4800.0
Rajasthan	1103.1	7784.7	872.2	1319.1	1178.1	1275.3
Tamil Nadu	0.5	0.5	0.5	0.4	0.4	0.4
Uttar Pradesh	4117.9	3754.7	4230.3	5840.7	6086.8	6314.3
West Bengal	28.0	34.0	45.5	71.7	300.1	400.0
All India	12257.0	10424.4	11392.8	16540.1	18651.6	20093.3

Source: Ministry of Agriculture, Government of India.

hectares or 37.0 percent of the total wheat area. Two States--Punjab and Uttar Pradesh--accounted for 61 percent of the total area under high-yielding varieties of wheat in 1969-70. In Punjab 65.5 percent of the wheat area was planted to high-yielding varieties and in Uttar Pradesh it was nearly 53 percent. This is a very rapid rate of adoption. There are other States in which the substitution of high-yielding varieties for local varieties was rapid, but wheat area in these States is small: e.g. Assam, Orissa, etc. There are a few States which have a modest area in wheat production and where about 30 percent of the wheat area was planted to high-yielding varieties in 1968-69: e.g. Haryana and Gujarat. Finally, there are States with rather sizeable area planted to wheat where the area under high-yielding varieties has increased very slowly or only at a moderate rate: e.g. Madhya Pradesh, Maharashtra, and Rajasthan.

While a large number of the wheat producing States have experienced some progress in the use of high-yielding varieties, the bulk of the progress has been concentrated in a relatively few States. In many ways, this should not be an unexpected phenomenon. The new varieties of wheat require, among other inputs, an adequate and timely supply of water and in the dry (<u>rabi</u>) season when wheat is grown, this means irrigation. Thus, the new varieties have been grown where the irrigation facilities are located and also where irrigation could be expanded rapidly: namely through tubewell development. This situation is basically consistent with one of the objectives of the New Agricultural Strategy: namely, to concentrate the production of high-yielding varieties on land with an assured water supply. We should keep in mind, however, that it was economic forces rather than administrative pressures that led to this pattern of production;

farmers produced the new varieties of wheat where it was profitable and they had the resources to do so, not because Government willed it to be so.

The growth in production of high-yielding varieties of rice in many ways stands in sharp contrast to that of wheat (tables 16a, 16b, and 16c). As of 1969-70 only 18.6 percent of the total rice area was planted to high-yielding varieties of rice. While some progress has been made with growing high-yielding varieties of rice in almost all States, none, with the exception of Jammu and Kashmir, has reached the intensity of use of the new seeds that characterizes U. P. and Punjab in the case of wheat. Only Tamil Nadu and Kerala seem to be making reasonably good progress in spreading the use of high-yielding rice varieties with 22.5 and 23.1 percent of the total rice area in each respective State being covered in 1969-70. 10/ While there appears to be less State-wide concentration in the production of high-yielding varieties of rice compared with wheat, this does not mean that there may not be considerable concentration of production within particular States.

Some of the basic reasons for the slower rate of adoption of high-yielding varieties of rice than wheat are well understood. In most of the rice producing areas dependent only upon monsoon rains or receiving water under unregulated canal or tank irrigation systems, there is a lack of control --either too much or too little--in the use of water, an important requirement if the yield potential of the new rice varieties is to be realized. Furthermore, insect and disease problems are more prevalent under conditions of heavy cloud cover and relatively low intensity of sunlight that prevail

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10/ We should keep in mind that two important varieties in these States are not truly high-yielding varieties, but improved local varieties--ADT 27 and C-28.

Table 16a. Paddy: Total Area and High-Yielding Variety (HYV) Area by States amd by Years 1966-67 to 1969-70.

State	1966-67		1967-68		1968-69		1969-70	
	Total	HYV	Total	HYV	Total	HYV	Total	HYV
	1000 hectares							
Andhra Pradesh	3322.9	275.2	3399.4	350.8	3053.4	506.4	3300.1	323.0
Assam	1972.7	2.0	2082.7	20.6	2199.2	60.7	2243.3	65.0
Bihar	4495.9	66.8	5255.4	255.8	5427.8	269.5	5492.9	253.0
Gujarat	497.3	0.4	513.8	54.1	489.4	27.0	499.1	40.0
Haryana	192.0	-	217.0	4.2	223.0	10.4	241.0	6.0
Jammu & Kashmir	223.6	8.1	226.5	50.6	239.2	118.9	241.3	101.0
Kerala	799.4	70.4	809.5	20.9	925.5	220.5	872.6	202.0
Madhar Pradesh	4209.3	52.6	4169.9	32.0	4391.2	131.5	4319.3	162.0
Maharashtra	1346.4	76.1	1367.4	68.2	1372.0	129.1	1392.3	162.0
Mysore	1123.8	29.6	1134.8	45.2	1192.6	74.7	1106.3	101.0
Orissa	4253.1	45.8	4336.5	121.1	4299.0	146.0	4506.2	162.0
Punjab	285.0	7.2	314.0	16.9	338.0	26.5	384.4	40.0
Rajasthan	78.4	0.4	95.0	0.8	129.4	4.9	115.0	8.0
Tamil Nadu	2628.1	152.6	2669.0	441.5	2571.9	638.8	2695.2	606.0
Uttar Pradesh	4445.8	69.2	4398.3	149.9	4521.1	330.6	4533.9	404.0
West Bengal	4648.7	26.3	4714.4	131.5	4838.8	195.5	5015.5	567.0
TOTAL	34522.4	882.7	35703.6	1764.1	36211.5	2866.7	37608.3	3234.0

Source: Ministry of Agriculture, Government of India.

Table 16b. Percent of Paddy Area Planted to High-Yielding Varieties, by States, 1966-67 to 1969-70.

State	1966-67	1967-68	1968-69	1969-70
	. . . . . percent			
Andhra Pradesh	8.3	10.3	16.6	9.8
Assam	0.1	1.0	2.8	2.9
Bihar	1.5	4.9	5.0	4.6
Gujarat	0.1	10.5	5.5	8.0
Haryana	-	1.9	4.7	2.5
Jammu & Kashmir	3.6	22.3	49.7	41.9
Kerala	8.7	2.6	23.8	23.1
Madhya Pradesh	1.2	0.8	3.0	3.8
Maharashtra	5.7	5.0	9.4	11.6
Mysore	2.6	4.0	6.3	9.1
Orissa	1.1	2.8	3.4	3.6
Punjab	2.5	5.4	7.8	10.4
Rajasthan	0.5	0.8	3.8	7.0
Tamil Nadu	5.8	16.5	24.8	22.5
Uttar Pradesh	1.6	3.4	7.3	8.9
West Bengal	0.6	3.4	4.0	11.3
TOTAL	2.6	4.9	7.9	8.6

Table 16c. Production of Rice by States, 1964-65 to 1969-70 by Year.

State	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70
	. . . . . 1000 metric tons					
Andhra Pradesh	5006.9	3961.4	4852.8	4673.8	4340.5	4700.0
Assam	1920.0	1847.4	1756.3	1979.8	2250.8	2057.5
Bihar	4913.7	4262.0	1645.2	4731.6	5197.4	4009.0
Gujarat	471.0	247.4	294.3	463.5	230.0	447.4
Haryana	264.6	204.0	223.0	287.0	265.0	371.0
Jammu & Kashmir	207.9	160.5	256.7	279.6	487.3	482.1
Kerala	1121.4	997.5	1084.1	1123.9	1400.0	1214.9
Madhya Pradesh	3505.7	1700.6	1910.3	3192.8	3004.6	3201.6
Maharashtra	1454.6	893.4	1065.0	1437.3	1368.8	1431.3
Mysore	1750.8	1159.7	1636.2	1796.9	2001.1	2290.0
Orissa	4420.2	3285.4	3691.6	3755.5	4698.6	4316.6
Punjab	351.0	296.0	338.0	415.0	460.0	592.9
Rajasthan	98.4	23.5	21.6	95.3	57.0	98.9
Tamil Nadu	4036.1	3709.4	4076.4	4115.6	3940.0	4532.2
Uttar Pradesh	3323.4	2342.0	2013.1	3262.1	2922.1	3532.9
West Bengal	5760.6	4893.1	4824.3	5208.2	6250.0	6350.0
All-India	39307.8	30655.1	30437.9	37612.2	39761.2	40429.7

Source: Ministry of Agriculture, Government of India.

during the monsoon season. In addition, the reduced availability of solar energy due to heavy cloud cover reduces yields. Economic factors may also be important, such as the lower price received for the high-yielding varieties of rice relative to prices received for local varieties. The high-yielding varieties of rice do much better during the non-monsoon seasons under irrigation. But, the amount of land with such irrigation is as yet very small.

There has been a range of experience with other cereal grains. High-yielding varieties of bajra are being planted on an increased area and there is a modest upward trend in total production (table 14). In the case of high-yielding varieties of jowar, disease and insect problems as well as problems of consumer acceptability have retarded their adoption and there has been no apparent growth in total jowar production during the decade of the 1960's. Among the different cereals, high-yielding varieties of maize were among the first to be developed and adopted in India. There has been continued growth in the use of these varieties. However, they are not without their serious problems and, for example, area planted to high-yielding varieties of maize has declined in recent years in the Punjab (33). Some of the reasons for this decline are higher costs of production, lower prices, variations in seed quality, etc.

To summarize: The New Agricultural Strategy was designed to get rapid increases in food grain production. New high-yielding varieties together with fertilizers and plant protection materials were to be concentrated on areas with assured water supply. Within the limits of available technology, this is what more or less has happened. It has happened more so in the case of rice for reasons already discussed; the experience with other food grains has been mixed, with bajra showing probably the most

promising results to date. Continued research in plant breeding will bring forth still better varieties of food grains adapted to local ecological conditions. Continued improvement in water management will also occur, but with many large-scale problems yet to be solved. There will undoubtedly be continued tubewell development in the Gangetic Plain, constrained, however, by the availability of power, pumpsets, credit, etc., and very likely by insufficient knowledge about the quantitative and qualitative adequacy of ground water supplied. Improvement of irrigation systems to bring better control of water use to individual farmer's fields and to make the systems more responsive to agricultural requirements in the rice areas will be a long-term effort. But as this effort is made as well as further improvements in rice varieties, we will see the continued spread of high-yielding rice varieties.

Distribution of benefits by size of farm

So far we have discussed the differential impact of the New Agricultural Strategy on different areas of the country. We turn now to the question of how different groups of farmers have been able to benefit from the new high-yielding varieties, namely, how it has benefited farms of different sizes.

In a recent article, P. K. Mukherjee (23) presents some data from the Programme Evaluation Organization's study of the High-Yielding Variety Program in 1968-69. The data are for three States (Tamil Nadu, Maharashtra and Punjab) and for three food grains (paddy, jowar, and wheat). The percentage distribution of cultivators in each size-of-farm category in the sample growing high-yielding varieties of the three food grains is presented in table 17.

The data for wheat in the sample of villages in the Punjab again

Table 17. Proportion of Cultivators Growing High-Yielding Varieties by Size of Operational Holdings.

Size of Holding	Paddy (Tamil Nadu) Kharif 1968	Paddy (Tamil Nadu) Rabi 1968-69	Jowar (Maharashtra) Kharif 1968	Jowar (Maharashtra) Rabi 1968-69	Wheat (Punjab) Rabi 1968-69
(acres)	. . . . . percent				
Below 2.5	70.33	52.36	9.43	7.20	96.77
2.5 - 4.9	68.48	60.82	26.36	8.06	98.67
5.0 - 9.9	74.69	69.40	23.08	8.08	97.74
10 - 19.9	82.35	69.70	19.15	11.91	98.65
20 - 49.9	95.23	100.00	29.37	17.70	98.45
50 & above	100.00	100.00	53.33	19.12	100.00
All sizes	72.09	57.70	23.17	10.65	98.28

Source: P. K. Mukherjee (23).

confirm how successful these new varieties have been. [11] Not only did 98.28 percent of the cultivators in the sample grow high-yielding varieties of wheat, but the distribution of the proportion of cultivators growing the new varieties ranged from 96.77 to 100.00 percent. In this sample, both small and large cultivators have benefited. For paddy in Tamil Nadu, 58 and 72 percent of the cultivators in the sample grew high-yielding varieties in the dry (rabi) and wet (kharif) seasons, respectively. During the kharif season, 70 percent of the smallest cultivators grew the new varieties compared with 100 percent of the largest cultivators; the comparable figures for rabi paddy are 52 and 100 percent. In the case of jowar in Maharashtra, 23 percent of the cultivators grew the high-yielding varieties in the kharif season, but only 11 percent did so in the rabi season. The range from smallest to largest cultivators was from 9 to 53 percent in the kharif season and from 7 to 19 percent during the rabi season.

While the small farmers seemed to benefit nearly as much per acre as the large farmers from the new varieties of wheat, this was not so in the case of paddy and especially not in the case of jowar. Even for wheat, the data for the Punjab may show overly optimistic results for wheat as a whole. As we saw in tables 15a and 15b, Punjab had the highest rate of adoption of the high-yielding varieties of wheat. The data indicate that the pre-conditions for the profitable use of the new wheat varieties, namely adequate irrigation, were present on a large scale and widely distributed. This is not the case in other States. [12] And, if irrigation, for example,

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[11] From other available evidence it would appear that small farmers in Punjab have used the new high-yielding varieties of wheat to a much greater extent than small farmers in other wheat producing states.

[12] Mukherjee and Lockwood (24) indicate that "the rank order of . . . states . . . based on the proportion of farmers using dwarf wheat seed in 1969-70 corresponds closely to a ranking of states by the proportion of the wheat crop irrigated."

is not as uniformly distributed among farms of different sizes, one would expect a less even distribution of the use of the new wheat varieties among farm-size groups.

At this point, it is worth discussing an important economic aspect of the New Agricultural Strategy: namely, that the main components of the new approach form a biological-chemical element of new technology which is neutral with respect to economics of scale or farm size. The chemical-biological element consists of the new seeds and chemical fertilizers. Since these inputs are perfectly divisible, there is no reason why significant scale factors should exist. Therefore, small as well as large farmers should get proportionately the same benefits from the new technology. The experience of Japan and Taiwan are cited to support this proposition.

While this analysis of the impact of the new technology on farms of different sizes is correct, it is at best a partial evaluation. For the neutrality-of-scale argument to be generally true, there would have to be an absence of scale economies with respect to all the other supporting inputs required for farmers to realize the full economic potential of the new high-yielding varieties. This may or may not be the case. There are several important supporting inputs which are available to farmers either mainly in terms of lumpy or discrete investments or through institutional structures which favor large over small farmers. Privately owned tubewells represent one form of lumpy investment giving rise to scale economies in the use of high-yielding varieties where irrigation is important. Of course, there are forms of economic organization such as joint investments in tubewell development by several small farmers which can reduce the lumpiness of this type of investment to the individual farmer; the same result can also be achieved through the sale of water to

smaller farmers by larger ones at reasonable rates. However, this form of economic organization is still the exception, rather than the rule.

With respect to institutional structures which favor larger over smaller farmers, the credit system represents one example among many. It is no secret that generally, larger farmers have access to proportionately more borrowed capital on easier terms than do small ones because of their stronger economic and social positions within the community (29). "Data from the 1969-70 Programme Evaluation Organization survey (of the High-Yielding Varieties Programme) show that the larger wheat and paddy farmers have begun to finance their current inputs and capital investments substantially from their own cash resources and have started to extend credit to neighbouring small and medium farmers. To some extent, the prevailing institutional credit structure could be helping to subsidize a new group of farmer money lenders" (24). Here again, there are alternative institutional arrangements which are less biased with respect to size of farm, but they too are probably in the minority at the present time.

Potential of the New Agricultural Strategy for Dealing with Problems of Income Distribution and Employment

Now that the problems of income distribution and employment in rural India have become much more important relative to the problems of self-sufficiency in food and fiber production, it is worth examining to what extent the New Agricultural Strategy as defined in this paper can contribute to the solutions of these problems.

One obvious extension of the New Agricultural Strategy is to achieve further varietal improvements in food grains which will make them economically superior to local varieties and spread their adoption within the present physical and economic environment. This means, for example,

further research work to develop varieties of paddy and jowar which are more resistant to prevailing insects and diseases and can yield higher rates of return to farmers under existing conditions of production. It also means that no single variety will be best for all of India; numerous varieties will have to be developed and adapted to the variations in production conditions, area by area. Success in these endeavors will result in a wider geographic coverage of the new technologies represented by the high-yielding varieties. It may also have some impact on the distribution of benefits of the new technology among farms of different size. This would occur to the extent that the physical and economic risk associated with some of the less adapted high-yielding varieties was significantly reduced and, as a consequence, these varieties were made more attractive to small farmers. This assertion assumes that small farmers are less able and less willing than larger farmers to adopt high-risk technology. While there is no conclusive evidence to fully support this assumption, there is a significant amount of evidence to indicate that the larger farmers do have more management skills, more access to information, and more financial resources to adopt risky, yet profitable new practices than do small farmers.

Beyond varietal improvement of food grains the things that need to be done fall outside the framework of the New Agricultural Strategy, as defined. They involve three basic sets of program and policy decisions: The first is to strengthen programs of varietal improvement for commodities other than food grains--other food and non-food crops. Second, more emphasis should be put on agricultural pursuits other than crop production--animal husbandry and forestry. And third, more effort will have to be devoted to improving the physical, economic and institutional "environment" for crop production to exploit more fully the yield potential of improved

crop varieties over wider geographic areas and among farms of various sizes by providing required inputs in adequate quantities to all sizes of farms.

Broader Program of Varietal Improvement and Production

The main thrust of the New Agricultural Strategy has been to increase the yield performance and production of food grains. While some new varieties contain some serious weaknesses which have prevented more rapid adoption, research efforts are under way to correct these deficiencies. When we turn from food grains to other food crops and to non-food crops, the prospects are less promising. A "Green Revolution" is not in sight for such crops as cotton (although varietal improvement is taking place), oil seeds, pulses, and some horticultural and vegetable items. Yet some of these commodities represent major sources of incomes for large agricultural areas of India. Intensified efforts to improve yields and expand production of these commodities will bring added income and employment to many areas that have not yet benefited much from the New Agricultural Strategy.

Livestock and Forestry

Insufficient attention has also been paid to such rural pursuits as livestock and forestry. Not only are research and technological considerations involved, but also investment decisions in production, processing and marketing commensurate with the growing demands. The future development of the livestock and forest product industries has important implications for bringing new employment and income opportunities to areas that have not and are not likely to benefit much from the New Agricultural Strategy. In addition, these industries offer opportunities for increasing employment and incomes of small farmers and landless labor. The impact of livestock development on the economic well-being of small farmers can be

illustrated by the way in which an organized system of milk marketing in Kaira district, Gujarat, has made possible a significant source of non-crop income for small farmers in that area. However, to reproduce this experience in other areas may require some new innovations in institution building.

Improving the Production Environment

One of the signal characteristics of the new high-yielding varieties of food grains, which form the basis of the New Agricultural Strategy, is that their performance is sensitive to the physical (and economic) environment in which they are grown. The new varieties of wheat and rice were bred to achieve a high yield response to heavy application of fertilizer. A concomitant factor in the realization of the high yield potential of these varieties is the availability of water in correct amounts and on a timely basis. This means a high degree of water control involving both controlled application of water and drainage systems capable of removing excess water. In addition, disease and insect problems will have to be made manageable whether through control of these problems in ways that are external to the varieties or by developing better inherent resistance in the plant.

In a study of the performance of the high-yielding varieties of rice and wheat in Asia, Barker (10) concludes that:

> "Data have been presented to support the hypothesis that differences in environmental conditions and not farmer's ability or knowledge have been responsible for the outstanding performance of the new wheat as compared with the new rice varieties. The typical environmental conditions under which the two crops are grown differ markedly. The production functions suggested that the potential response of the high-yielding rice varieties is equal to that for the new wheat varieties under the same environmental condition. However, given the difference in growing conditions for dry

> climate wheat and rice as compared with rice in the monsoon, not only the degree of response but the year-to-year variability in response must influence the farmer's willingness to apply inputs. The wide differences that can be observed in production gains to date give support to the importance of the environment.
>
> "Acceptance of the above hypothesis has important policy implications for Asian countries. Sustained gains in rice production can be achieved principally by reducing the risk and uncertainty facing farmers. Continued effort will be required to improve and expand irrigation and drainage facilities. At the same time, more attention will need to be given to improvement of production potential under rainfed and upland conditions. It will be necessary to invest adequate research funds in the development of insect and disease resistant varieties. Resistant varieties for the long run appear to offer a more fruitful approach than emphasis on insecticides which for the individual farmers are expensive and offer uncertain benefits."

Barker's conclusions call for two lines of action. On the question of disease and insect problems, researchers should try to build as much resistance into high-yielding varieties as is practicable. This is clearly within the purview of the New Agricultural Strategy. So too would be the further development of food grain varieties suitable to rainfed areas. On the other hand, development of water resources through irrigation and drainage programs which would yield a high degree of water control on farmers' fields represents an extremely large area of program activity that falls outside the framework of the New Agricultural Strategy. Yet the water factor represents one of the major restraints not only on total agricultural production, but also on spreading the benefits of the New Agricultural Strategy over larger areas and among different size-groups of farmers. For example, a recent study (12) by U. P. Agricultural University of recent changes in the agriculture of two areas in Western U. P. states that "Irrigation deficiencies

remained substantial . . . and certainly critical for the small, medium and very small cultivators." This conclusion has also been substantiated in a study of small farmers in Gujarat (40).

In addition to the physical environment one has also to consider the social and economic environment within which farmers operate, particularly the small farmers and those with tenuous relations to the land they farm. The New Agricultural Strategy has dramatized many inherent inequities in the rural institutional structure which have been present for a very long period.

> "It is not . . . the new technology which is the primary cause of the accentuated inbalances in the countryside. It is not the fault of the new technology that the credit service does not serve those for whom it was originally intended; that the extension services are not living up to expectations; that the panchayats are political rather than developmental bodies; that security of tenure is a luxury of the few; that rents are exhorbitant; that ceilings on agricultural land are notional; that for the greater part tenurial legislation is deliberately miscarried; or that wage scales are hardly sufficient to keep soul and body together." (19)

Again, it is clear that the New Agricultural Strategy was not designed to reduce or eliminate the inherent inequities in the rural institutional structure, nor is it capable of doing so. Something much more in the way of development programs will be needed.

Something More Is Needed

That the New Agricultural Strategy did not have as its main goal the achievement of a more equitable distribution in rural India is clear. It is also clear that the New Agricultural Strategy, as defined, has only limited potentials for dealing with the major problem of inequitable distribution of income. Therefore, something much more is needed.

Undoubtedly, the New Agricultural Strategy, in the areas in which

it has had an impact has contributed something to increasing employment and incomes of the small farmer and landless laborers. And, with further improvements in certain elements of the strategy, such as improving the adaptability of some high-yielding varieties of food grains, more can be accomplished. However, we have also seen that there are major restraints operating on the spread of the new technology. Among the more important of these is the improvement of water management--achieving a higher degree of water control on farmers' fields through extension and improvement of irrigation facilities as well as making better use of surface water in rainfed areas with limited potential for irrigation. These are complex, long-term, and costly activities involving programs outside the present scope of the New Agricultural Strategy.

When we talk about a more equitable level of income distribution we are really talking about reducing or eliminating the grinding poverty in rural India; i.e., improving economic conditions for from 165 to 206 million rural people. Dandekar and Rath (14) have quantified the magnitude of rural poverty (using the same income criteria as Bardhan) in India likely to prevail in the 1970's. They estimate that it will take resources valued at nearly Rs. 1,000 crores [13/] annually to eliminate poverty from rural India.

Several measures to deal with rural poverty and reduce the imbalances in rural income have been formulated as programs or proposed as possible program activities. Each of these directs its focus specifically to the problem of poverty and what can be done about it. Each also has other objectives related to increasing agricultural output

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13/ 1 crore equals 10,000,000

and rural employment generally. However, the output objective is not given major weight in terms of national objectives; it is considered very important as a means of improving the economic well-being of certain segments of the rural poor who have opportunities to farm and expand their production.

The Government of India has initiated a program to assist in developing the production and income potential of small farmers and to provide additional employment to landless laborers. This program will operate through the Small Farmers Development Agency with programs in some 46 districts during the Fourth Plan, and similar administrative agencies will be in charge of programs for marginal farmers and landless laborers. 14/ Assistance to increase production will be provided to potentially viable farmers (those who could earn a minimally acceptable level of income from farming). For those operating marginal farms and for landless labor, assistance will be provided through fostering supplemental occupations and non-farm employment opportunities.

The estimated resources available during the Fourth Plan for the program of the Small Farmer Development Agency to help potentially viable farmers are as follows: Rs. 115 crores of direct financial support from the Plan, and Rs. 90 crores of short-term credit per annum and Rs. 170 crores of medium- and long-term credit during the Plan period from various financial institutions. The estimated resources available for generating supplemental occupations and non-farm employment for the very small farmers and landless labor are Rs. 10 crores of short-term credit per annum and Rs. 30 crores of medium and long-term credit per annum. While this

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14/ For a description of the program see Venkatappiah (39) and (15).

program is a step in the right direction, it must be recognized that it is a modest effort, indeed, compared with the magnitude of the employment and poverty problems in rural India.

Another area which is receiving increased attention is the decades old and vexing problem of land reform. There are two aspects of reform which are particularly relevant to a discussion of income distribution--security of tenure and redistribution of land holdings. 15/

While every State in India has abundant legislation for providing security of tenure to cultivators and limiting the size of holdings, more often than not this legislation is not enforced. Ceilings and land holdings are evaded by registering parcels of land in the names of numerous relatives, for which there is no shortage, and the rights of tenants are ignored through a variety of devices, ranging from the most subtle to the most crude.

In addition to providing tenants with incentives to be "better farmers", we are concerned with a broader issue of providing the small farmers with the same legal rights as others, and thereby reducing or hopefully eliminating the discriminatory practices of institutions (and markets) which work against them. A secure tenant, i.e., one who can demonstrate a legal set of rights to the land he operates in the context of a legal system which enforces the laws, would have access to credit on an equal footing with the landowner. He would be able to purchase needed inputs and make desired capital investments on a non-discriminatory basis. He would also be able to better work out arrangements with landlords for

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15/ For an excellent review of land policies in India, see Dandekar and Rath (14).

the sharing of costs of production inputs and capital investments required to avail himself of the new technology. Where these investments are highly profitable, the landowner may be moved to do this himself, downgrade the status of a tenant to that of a laborer, and capture most of the new found profit for himself. While the effect on production might not be much different under either approach, the resulting impact on the distribution of incomes could be quite different.

There is also renewed interest in ceilings on land holdings--both the enforcement of existing ceiling legislation and the lowering of present ceilings. The aim is to take surplus land away from large landowners and distribute this surplus land to small farmers for the enlargement of their farms or to landless labor who currently own or operate no land. It is of interest to see the implications for redistribution of income of such an approach.

An illustration of what can be accomplished by lowering the ceilings on land holdings (and enforcing them) is presented in table 18. These data are for 1960-61. The average size holding varies from 1.32 acres in Kerala to 12.36 acres in Rajasthan. Much of the variation in the average size holding among States is accounted for, over a long period of time, by the levels of rainfall and the amount of irrigated land. In other words, population density has generally adjusted to land productivity. The proposed minimum amount of land to be given to rural households varies from 0.5 acres to 5.0 acres. We should keep in mind that the minimum land holdings being proposed are extremely small and do not represent financially viable farming units. The ceilings on land holdings proposed in this exercise would range from 7.5 acres in Kerala and West Bengal to

Table 18. Imposition of Ceilings and Redistribution of Surplus to the Landless and the Small Cultivators.

State (1)	Average Area per Rural Household (acres) (2)	Proposed Minimum Area to Be Given (acres) (3)	Percent of Households Below Minimum (4)	Surplus Area Needed (million acres) (5)	Proposed Ceiling Area (acres) (6)	Percent of Households Above Ceiling (7)	Surplus Area Available (million acres) (8)
Kerala	1.32	0.5	54.05	0.538	7.5	2.97	0.507
Tamil Nadu	1.94	0.5	51.98	1.676	10.0	3.55	1.498
Assam	2.29	0.5	39.58	0.379	7.5	5.39	0.347
West Bengal	2.55	0.5	41.17	0.927	10.0	4.50	1.031
Jammu and Kashmir	3.10	0.5	16.72	0.045	15.0	1.16	0.043
Union Territories	3.21	0.5	33.33	0.064	15.0	1.69	0.064
Bihar	2.88	1.0	46.31	2.975	12.5	3.66	2.936
Orissa	3.31	1.0	42.80	1.434	15.0	5.08	1.437
Uttar Pradesh	3.51	1.0	35.39	3.715	15.0	3.32	3.884
Punjab	5.45	1.0	49.32	1.149	25.0	3.97	1.239
Andhra Pradesh	4.24	2.5	65.95	8.982	15.0	7.23	7.738
Mysore	6.80	2.5	43.99	3.280	25.0	6.17	3.326
Gujarat	7.39	2.5	47.09	3.020	25.0	7.55	3.443
Madhya Pradesh	7.62	2.5	39.20	4.135	30.0	3.78	4.292
Maharashtra	7.72	2.5	48.60	5.357	30.0	5.83	5.662
Rajasthan	12.36	5.0	43.47	3.905	50.0	3.55	4.394

Source: Dandekar and Rath (14).

50.0 acres in Rajasthan. These ceilings are significantly lower than those that now prevail in most States. For example, depending on the type of land, the ceilings in Andhra Pradesh range from 27 to 324 acres; from 20 to 60 acres in Bihar; from 22 to 336 acres in Rajasthan; from 25 to 75 acres in Madhya Pradesh; from 40 to 80 acres in Uttar Pradesh; from 18 to 126 acres in Maharashtra; from 19 to 132 acres in Gujarat; from 27 to 216 acres in Mysore; and from 20 to 80 acres in Orissa (14).

The proposed ceilings would provide just about enough surplus land to provide every household with at least the minimum acreage specified. But all said and done, in a State like Kerala where 54.05 percent of the rural households operated no land or less than 0.5 acres, that proportion of the households would now operate only 0.5 acres. In a State like Andhra Pradesh one would have succeeded in providing 65.95 percent of the rural households with minimum sized holdings of 2.5 acres.

Clearly, the redistribution of land does not offer a total solution to the problem of rural poverty in India. 16/ There just is not enough land to go around! But that does not mean that redistribution of land should be ignored. As long as no single program can solve the problems of rural poverty, all those approaches which contribute to an effective solution should be considered. And, the redistribution of land is one such approach.

16/ If, instead of providing the surplus land to landless labor and to operators of very small holdings below the prescribed minimum, one gave this land to cultivators who could expand the size of their holdings to a "financially viable" size, one is still left with a very large number of landless laborers and rural poor. All the landless laborers and the bulk of the very small cultivators in all States would have to be ignored in the process of redistributing land (14).

All said and done, while increased agricultural production resulting from the New Agricultural Strategy and some measures of land reforms will help to increase employment opportunities for the rural poor, these efforts will not be nearly enough to deal with the poverty problem. Therefore, a major program of rural employment designed to permanently withdraw labor from agriculture is required. This approach is by no means a new one,[17] but none the less, there has not been a concerted effort in this direction.

It has been estimated that it would require resources of Rs. 1,000 crores a year during the 1970's to eliminate poverty from rural India: i.e., to provide everyone, except the poorest 5 percent of the rural population consisting of people unable to work, like the blind, widows without families, etc., [18] with employment which would provide them with a minimum monthly income of Rs. 15 per month in 1960-61 prices. It is estimated that if between 10 and 12 million persons could be provided employment outside of traditional agricultural pursuits at a satisfactory minimum wage, those remaining in agriculture would have enough work to achieve a minimum level of living (14).

But a poor country like India cannot afford a "make-work" or welfare program of Rs. 1,000 crores a year. The focus must be on using rural labor to create <u>productive</u> capital, which would have to be primarily in rural areas. This requires at least three ingredients: (1) The identification of labor intensive projects in rural areas of a labor intensive type which would generate 10 to 12 million new jobs and result in investments which would contribute to further agricultural and economic development;

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[17] See Abel (1) for a review of earlier discussions of the subject.

[18] The income problems of the unemployable persons could be handled by standard welfare measures.

(2) Mobilization of sufficient administrative and technical personnel, and complementary capital inputs to run an effective, large-scale employment program; (3) The mobilization of about Rs. 1,000 crores of real resources to finance an expanded employment program.

It will not be easy to provide any of these ingredients. The identification of worthwhile projects is the easiest of all. There are numerous projects of a labor intensive type which are either in process--and work on them could be accelerated, or have been identified and could be started quickly. We would place in these categories such things as surface irrigation and drainage projects which would have a direct impact on agricultural productivity and production, and rural roads which would lower the cost of providing inputs to farmers and increasing their returns from the products they sell.[19/] It would be more difficult to provide the additional administrative and technical skills and capital resources. In the short run, one could draw upon unemployed engineers and managers. However, some human and capital resources would have to be diverted from other uses. In the longer run, the required level and types of personnel could be produced by the variety of educational and training institutions in the country. Clearly the most difficult ingredient, in a political sense, is the generation of about Rs. 1,000 crores annually of public resources to finance the program. It means taxing the rich, including the rural rich who now pay no income taxes or earnings from agriculture.

An expanded employment program of the type described above would have one important indirect effect on employment in the economy. The

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19/ There are many areas in India such as Eastern Uttar Pradesh or parts of Bihar where numerous villages with potentially productive land are 20 miles from the nearest all-weather road.

redistribution of consumption away from the rich in favor of the poor would increase the demand for products which are labor intensive in their production such as food, simple clothing, simple household utensils, etc. and reduce the demand for consumer durables such as automobiles, etc. which are capital intensive. This could have a salutory effect on development in a country which is very short on capital and whose industrial sector has not held out much promise to date for absorbing large numbers of additional employees.

Conclusions

The New Agricultural Strategy has been quite successful in achieving what it was designed to do: namely, achieve a rapid increase in total food grain production. It now seems somewhat unjust to criticise this approach for not bringing the benefits of the "Green Revolution" to certain areas of the country and classes of rural people when, in fact, it was not a major objective of the programs. Rather, attention should be focused directly on the problems of income distribution and poverty in rural India and what is required to bring about significant improvement in these problem areas. Care should be taken not to undermine the technological basis for increasing agricultural production in the push to achieve a better distribution of income.

Increased productivity in the agricultural sector undoubtedly will provide additional employment. Too, land reform measures could contribute to a more equitable distribution of rural incomes. But when one looks at the magnitude of rural poverty in India and the rate at which population is likely to grow, it is unlikely that these measures will be enough.

Therefore, a country like India must find a way to generate the real resources and management and technical skills to provide additional full-time employment for 10-12 million people in pursuits which will contribute to the formation of productive capital and sustained economic growth. In the last analysis, it may be more of a political than an economic problem. But politics of whatever variety are not unimportant.

If this analysis of rural income distribution and poverty in India has any relevance to other countries of Asia, it is in terms of recognizing the structural magnitude and nature of rural poverty in a poor, primarily rural, country; that there is no single solution to the problem, be it land reform or the "Green Revolution"; and that numerous measures, particularly those which favor labor intensive approaches to capital formation are required and will be needed for a long time to come.

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